

**INSTRUCTIONS FOR:
EXTERIOR WALL OPENING WORKSHEET**

There are several factors that are required to determine compliance for exterior wall openings. Please note that the exterior opening requirements are to be done on a per floor level basis.

The first column within the worksheet table is titled "wall designation" and is used to reference the exterior wall being considered. Within this column, information on all of the exterior walls for each floor level of the building can be provided or only the worst case scenario can be provided for each side of the building. It should be noted that for some buildings, the wall areas for differing sides of the building that would be considered the most restrictive could be located on different floor levels. For example, the worst case for a west wall may be the second floor wall area while on the north face the worst case may be the third floor wall area. For such example the worksheet needs only to include the worst case scenario for each wall face and does not have to be completed for all the wall faces of each floor.

The second column is titled "wall area" and is the exterior wall area of the wall designation that is being considered. Since the requirements for exterior wall openings are to be done on a per floor level basis, the associated wall area is also to be on a per floor level basis. The definition of story in section 202 of the IBC is **that portion of a building included between the upper surface of a floor and the upper surface of the floor or roof above**. The associated wall area for the exterior wall for the wall designation being considered then should be the horizontal dimension of the exterior wall multiplied by the height of the story, as defined above and in section 202 of the IBC. Wall areas must be provided within the table for all wall designations being provided.

The third column is titled "fire separation distance". Section COMM 62.0702 provides the definition for fire separation distance. Fire separation distance is the distance measured from the building face to the closest interior lot line, to a centerline of a street, alley or public way, to a permanent no-build easement line, or to an imaginary line between two buildings on the same property. Fire separation distances are measured at right angles from the lot line. Fire separation distances must be provided within the table for all of the wall designations that are being considered.

The fourth column is titled "area of unprotected openings (A_u)". It is the area of all openings in the exterior wall that do not have a fire resistance rating for the wall designation being considered. If openings are provided that have a fire resistance rating, the areas of such openings are not to be included in this column, but should be included within column 5. The area of all unprotected openings for the wall designation being considered must be provided within the table.

Please note that for determining opening areas, both protected and unprotected, the opening area is calculated as the area from jamb to jamb in the vertical and horizontal directions of the opening.

The fifth column is titled "area of protected openings (A)". It is the area of all openings in the exterior wall that have a fire resistance rating for the wall designation being considered. If openings are provided that do not have a fire resistance rating, the areas of such openings are not to be included in this column, but should be included within column 4. The area of all protected openings for the wall designation being considered must be provided within the table.

Please refer to section 714 of the IBC for specific requirements for opening protectives. Such section provides the requirements for when door and window openings are considered protected.

The sixth column is titled " % factor from Table 704.8 for unprotected openings" and the value of such is obtained from Table 704.8 of the IBC. The percentage of unprotected openings within Table 704.8 is

based on the fire separation distance associated with the wall designation being considered. The footnotes under Table 704.8 should also be referred to when using such table. The percentage value for unprotected openings must be provided on the worksheet for the wall designation being considered.

The seventh column is titled "allowable area of unprotected openings (a_u)" and is the maximum allowable area of unprotected openings permitted by section 704.8. The allowable area of unprotected openings (a_u) is obtained by multiplying the wall area (column 2) by the % factor from Table 704.8 for unprotected openings (column 6). The allowable area of unprotected openings (a_u) must be provided in the worksheet table for the wall designation being considered.

Column eight is titled "% factor from Table 704.8 for protected openings" and the value of such is obtained from Table 704.8 of the IBC. The percentage of protected openings within table 704.8 is based on the fire separation distance associated with the wall designation being considered. The footnotes under table 704.8 should also be referred to when using such table. The percentage value for protected openings must be provided on the worksheet for the wall designation being considered. Protected openings are openings that comply with the applicable requirements of section 714 of the IBC.

The ninth column is titled "allowable area of protected openings (a)" and is the maximum allowable area of protected openings permitted by section 704.8. The allowable area of protected openings (a) is obtained by multiplying the wall area (column 2) by the % factor from Table 704.8 for protected openings (column 8). The allowable area of protected openings (a) must be provided in the worksheet table for the wall designation being considered.

Column ten is titled "ratio of unprotected openings (A_u/a_u)". This is the check to ensure that the area of unprotected openings is not greater than the allowable area of unprotected openings for the wall designation (column 4 divided by column 7). The ratio of the area of unprotected openings to the area of the allowable unprotected opening must be less than 1.0. The ratio of unprotected openings must be provided in the table for the wall designation being considered.

Column eleven is titled "ratio of protected openings (A/a)". It is the check to ensure that the area of protected openings is not greater than the allowable area of protected openings for the wall designation (column 5 divided by column 9). The ratio of the area of protected openings to the area of the allowable protected openings must be less than 1.0. The ratio of protected openings must be provided in the table for the wall designation being considered.

The final column, twelve is titled "interaction check of ratios (A_u/a_u) + (A/a)". This equation is the final check to ensure that the total area of all openings within the wall designation being considered is allowed. Section 704.8 of the IBC requires that a unity check be performed to verify that the total opening area of the unprotected and protected openings does not exceed 1.0. For all wall designations being considered the interaction check of the ratios must be provided.

If the interaction value is greater than 1.0, then the exterior wall openings for the wall designation being considered is in violation of section 704.8 of the IBC and the openings must be reduced in area until the interaction equation is equal or less than 1.0. One possible solution to obtain compliance without decreasing the amount of total openings would be to reduce the number of unprotected openings and increase the number of protected openings.

If the interaction value is equal or less than 1.0 then the exterior wall openings for the wall designation being considered is in compliance with section 704.8 and no modifications to the exterior wall openings need to be provided.

Wall section	Opening sizes & use	
	First floor level	Second floor level
North wall: (wall 1)	3 - 3' by 7' walk doors = 63 ft ² 4 - 4' by 4' windows = 64 ft ²	4 - 4' By 4' windows = 64 ft ²
West wall: (wall 2)	2 - 3' by 7' walk doors = 42 ft ² 3 - 4' by 4' windows = 48 ft ²	2 - 6' By 4' windows = 48 ft ² 3 - 4' by 4' windows = 48 ft ²
South wall: (wall 3)	2 - 3' by 7' - walk doors = 42 ft ² 1 - 12' by 8' overhead door = 96 ft ² 3 - 8' by 6' windows = 144 ft ²	10 - 8' by 6' windows = 480 ft ²
East wall (north & south portions included): (wall 4)	4 - 4' by 4' windows = 64 ft ²	6 - 4' by 4' windows = 96 ft ²
East court wall: (wall 5)	1 - 12'by 8' overhead door = 96 ft ² 2 - 4' by 4' windows = 32 ft ²	10 - 4' by 4' windows = 160 ft ²
North court wall: (wall 6)	2 - 3' by 7' walk doors (protected openings) = 42 ft ² 4 - 6' by 6' windows (unprotected) = 144 ft ²	5 - 6' by 6' windows = 180 ft ²
South court wall: (wall 7)	2 - 3' by 7' walk doors (protected openings) = 42 ft ² 4 - 6' by 6' windows (unprotected) = 144 ft ²	5 - 6' by 6' windows = 180 ft ²

Note that all openings indicated above are unprotected unless noted differently.

Exterior wall area associated with the floor level and wall location designated in Column 1.

(Column 2) X (Column 8)

(Column 2) X (Column 6)

(Column 4) / (Column 7)

(Column 10) + (Column 11)

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(Column 5) / (Column 9)

Wall designation	Wall area	Fire separation distance	Area of unprot. openings (A_u)	Area of protected openings (A)	% factor from Table 704.8 for unprot. openings	Allowable area of unprot. openings (a_u)	% factor from Table 704.8 for protected openings	Allowable area of protected openings (a)	Ratio of unprot. openings (A_u/a_u)	Ratio of protected openings (A/a)	Interaction check of ratios ($A_u/a_u + A/a$)
Wall 1, 1 st floor	145 X 10 = 1450	18'	127	0	25 %	362.5	75 %	1087.5	0.35	0	0.35
Wall 2, 2 nd floor	110 X 10 = 1100	12'	96	0	15 %	165	45 %	495	0.58	0	0.58
Wall 3, 2 nd floor	145 X 10 = 1450	40'	480	0	100 %	1450	100 %	1450	0.33	0	0.33
Wall 4, 2 nd floor	2 X 35 X 10 = 700	18'	96	0	25 %	175	75%	525	0.55	0	0.55
Wall 5, 2 nd floor	40 X 10 = 400	83'	160	0	100 %	400	100 %	400	0.40	0	0.40
Note: Both floor levels need to be considered since by observation it cannot be determined which floor level would be controlling.											
Wall 6, 1 st floor	65 X 10 = 650	20'	108	42	25 %	162.5	75 %	487.5	0.66	0.25	0.66 + 0.25 = 0.91
Wall 6, 2 nd floor	65 X 10 = 650	20'	180	0	25 %	162.5	75 %	487.5	1.11	0	1.11
Wall openings proposed for walls 6 and 7 of the 2 nd floor are not permitted as ratios are more than 1.0											
Wall 7, 1 st floor	65 X 10 = 650	20'	108	42	25%	162.5	75 %	487.5	0.66	0.25	0.66 + 0.25 = 0.91
Wall 7, 2 nd floor	65 X 10 = 650	20'	180	0	25 %	162.5	75%	487.5	1.11	0	1.11

Column 1

Column 2

Column 3

Column 4

Column 5

Column 6

Column 7

Column 8

Column 9

Column 10

Column 11

Column 12

IN ORDER FOR AREA OF OPENINGS TO BE ALLOWED ALL OF THE VALUES IN COLUMNS 10, 11, & 12 MUST BE EQUAL OR LESS THAN 1.0. Possible methods of achieving compliance could include:
 Reduce total amount of openings in wall, Reduce amount of unprotected openings in wall and provide protected openings, Increase wall area in column 2 by making court area deeper, or Increase distances to imaginary property line by increasing the width of the court, thus changing the "% factors from Table 704.8.

